



Issue 13, September 17, 1998

Feature Story

Each month we'll provide a feature article on key industry trends and developments. Authored by a member of Intel's Executive Staff, you'll find insightful and useful information for product development, planning and execution.

Top News Stories

Delivering an in-depth report on key platforms, products and technologies, our Top Stories provide a monthly source of information on the issues affecting hardware developers. Be sure to check in every month for the latest stories that are driving the evolution of the industry.

Platform News and Information

Every month we cover the latest developments in platform initiatives and technologies. Our "Platforms" pages provide news on the latest trends and initiatives for the business, home, mobile, server and workstation platforms. Our "Industry Events" page keeps you up to date on upcoming industry gatherings targeted at the platform and peripheral developer, including the new Intel Developer Forum.

Technology News

Our "Technologies" pages give you quick and detailed information on the industry status of specific platform technologies, from the emergence of the Accelerated Graphics Port (AGP) to the latest advances in Intel® microprocessors, memory, Audio, USB, 1394, DVD, Power Management, and PC 98/99. This department is your source for the hottest technology and product announcements, white papers, design guides, specifications, tools and developer events available to the industry.

Reader Services

If you are new to *Platform Solutions* and would like to receive this companion newsletter to the on-line version, please visit *Platform Solutions* on-line and go the "Subscribe Now" section to register and sign up for delivery. The on-line version provides lots of direct links for quick access to the developer information and news reported in each issue, whether it's on Intel's Web site or industry Web sites. Please visit the following URL: <http://developer.intel.com/solutions>

We want you to consider *Platform Solutions* as your personal information resource for the Intel® Architecture platform. If you can help us make it better, or if you have a comment, question or a specific topic you would like to see covered, we want to hear from you. Please take the opportunity to send us an e-mail with your specific feedback or request to: platform.solutions@intel.com

If you do not want to receive this mailing in the future, please send an email to: platform.solutions@intel.com with "unsubscribe" in the body of the message.

On behalf of all of us at Platform Solutions, welcome to the future of the PC platform!

DISCLAIMER: THE MATERIALS ARE PROVIDED "AS IS" WITHOUT ANY EXPRESS OR IMPLIED WARRANTY OF ANY KIND INCLUDING WARRANTIES OF MERCHANTABILITY, NONINFRINGEMENT OF INTELLECTUAL PROPERTY, OR FITNESS FOR ANY PARTICULAR PURPOSE. IN NO EVENT SHALL INTEL OR ITS SUPPLIERS BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS, BUSINESS INTERRUPTION, LOSS OF INFORMATION) ARISING OUT OF THE USE OF OR INABILITY TO USE THE MATERIALS, EVEN IF INTEL HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME JURISDICTIONS PROHIBIT THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU. INTEL FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS, LINKS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. INTEL MAY MAKE CHANGES TO THESE MATERIALS, OR TO THE PRODUCTS DESCRIBED THEREIN, AT ANY TIME WITHOUT NOTICE. INTEL MAKES NO COMMITMENT TO UPDATE THE MATERIALS.

Table of Contents

FEATURE	3
DELIVERING ON THE STRATEGY OF MARKET SEGMENTATION.....	3
FOCUS.....	5
DESIGNING PLATFORM SOLUTIONS: FROM THE SOURCE.....	5
TOP STORIES.....	8
MOBILE PLATFORMS: THE VISION BECOMES A REALITY AT IDF.....	8
WTX: A FLEXIBLE WORKSTATION FORM FACTOR.....	11
THE INTEL MOBILE POWER INITIATIVE: RAISING THE PERFORMANCE BAR	14
IPEAK I/O MONITOR: EASING THE TRANSITION TO WDM.....	17
MAXIMIZING AGP PERFORMANCE IN DESKTOP PCs.....	19
PC DESIGN AND THE POWER-MANAGEMENT CHALLENGE	22
WfM BASELINE SPECIFICATION V2.0 EXTENDS PC MANAGEMENT CAPABILITIES	24
REMOTE WAKE-UP COMES TO MOBILE COMPUTING.....	26
PLATFORM NEWS.....	28
NEWS FROM IDF.....	28
BUSINESS.....	28
<i>Join Technology @ Work.....</i>	28
<i>Intel Announces New Dual Port Server Adapter</i>	28
<i>Intel Introduces Pentium® II OverDrive® Processor For Pentium Pro Processor-Based Systems</i>	28
CONSUMER.....	28
<i>IEEE 1394.....</i>	28
SERVER	28
TECHNOLOGY NEWS.....	29
NEWS FROM IDF.....	29
MICROPROCESSOR.....	29
<i>Introducing the Pentium® II Processor 450 MHz.....</i>	29
DVD	29
<i>Join us at the U.S. DVD Conference in San Francisco, October 1–2</i>	29
WIRED FOR MANAGEMENT	29
<i>Intel releases new Wired for Management Baseline Specification v2.0.....</i>	29
INTEL ARCHITECTURE LABS.....	29
<i>IAL Adds Spice to Sausage Software.....</i>	29
<i>New Home for Conferencing and Telephony.....</i>	29
<i>First Phase of SWAP Completed</i>	30
<i>New Network Management Solutions.....</i>	30
<i>New Add-on to Simple Network Management Protocol</i>	30
INDUSTRY EVENTS.....	31

Feature

Delivering on the Strategy of Market Segmentation

By Dr. Craig R. Barrett
President and CEO, Intel Corporation

Connected Computing continues to drive growth in the PC industry, and the reality of one billion connected computers interacting via the Internet is only a handful of years away. While the industry grows, Intel's immediate focus has been delivering on the market segmentation strategy we unveiled at the Intel Developer Forum last February.

Market segmentation, which will again be a theme at this month's Intel Developer Forum in Palm Springs, California, involves PCs moving into more segments of the computing market—from basic PCs on the low end to workstations and servers on the high end. In the past six months, Intel has quickly and competitively delivered products which meet the performance and capability needs of these segments. For example, Intel® Celeron™ processors at speeds of 300 and 333 MHz offer ideal price performance for the basic PC segment, and the Intel Pentium® II Xeon™ processor is specifically optimized for workstation and server performance and scalability.

Intel will strengthen its segmented roadmap in 1999 with the first half introduction of the Katmai processor with Katmai New Instructions. While the Merced processor due to be introduced in the year 2000 will ignite Intel's IA-64 lineup in the server market segment, Intel will follow the initial launch of the Katmai processor with new manifestations of IA-32 processors targeted at all segments of the market. Intel will also introduce next year new products in the server, mobile and basic PC segments, as well as the handheld appliance market via Intel's StrongArm* processor technology.

To help developers advance the PC platform and meet the specific needs of market segmentation, Intel will begin introducing hardware implementation specifications that are intended to provide target specifications covering a range of platform aspects from motherboard to thermal requirements. These specifications will make it easier for developers to deal with the complexity of a new, segmented roadmap. Furthermore, Intel is forming its own publishing arm to publish the specifications and make them widely available to the industry.

However, for the industry to reach one billion connected computers, we have to collectively focus on several platform issues as well as a segmented roadmap. These platform issues include making the PC easier to use, ensuring it is operating in a secure environment and increasing its available bandwidth.

US PC home penetration is around 44 percent and many small businesses do not yet have Connected Computing environments. The industry has to work on making the PC easier to use to increase these percentages. A first step in accomplishing that goal is removing the legacy or outdated technologies that have unnecessarily remained with the PC when new technologies were introduced. Intel aims to reduce the number of these outdated legacy technologies, such as the ISA (Industry Standard Architecture) bus, by the year 2000. On the topic of security, the industry needs to address issues, such as encryption and user authentication, to deliver on the promise of new businesses like commerce over the Internet. And all the while we need to look at increasing bandwidth for consumers and businesses alike, so users of new connected applications are no longer bandwidth constrained.

Meanwhile, Intel will continue to invest its energies in developing new technologies to advance the PC platform. As part of our market segmentation strategy, Intel has multiple design teams focused on designing unique components for each market segment, and our industry-leading process technology efforts that have aggressively scaled to .25 micron this year will be fully converted to .18 micron in two years. These process technology advances are not only due to Intel's design work, but they can also be attributed to our manufacturing efficiencies. Finally, Intel has developed a proprietary technique for backside silicon probing analysis as part of our ongoing goal for improving silicon performance.

Indeed, the reality of one billion connected computers is not far away, and Intel is poised to work with the industry over the next few years to accomplish that goal.

About the Author:

Dr. Craig R. Barrett (<http://intel.com/pressroom/kits/bios/barrett.htm>) is the President and CEO of Intel Corporation.

Focus

Designing Platform Solutions: From the Source

The number of development decisions and new technologies facing platform developers makes designing platform solutions a daunting task. Developers have to consider the complexities of platform design, like how to:

- Meet Basic PC system cost goals without sacrificing performance
- Improve server design to support complex applications across the enterprise
- Meet the demand for Intel® Architecture-based midrange workstations
- Create embedded platform solutions to meet specific price points
- Design next-generation low-power, high-performance, affordable mobile platforms

This summer's Intel Developer Forum (IDF) will help you find your way through the complexities of platform design. IDF features technical information and hands-on experience you won't get anywhere else—three days of focused training on platform design. There are tips, tricks, and the latest tools, as well as technical information on all the hot new technologies that are driving the platform. At IDF, you'll get it all—straight from the source.

Three Days in September

Tuesday—September 15th

IDF starts on Tuesday, September 15, with keynotes by Dr. Craig Barrett, Intel President and CEO, and Dr. Albert Yu, Senior Vice President and General Manager of the Intel Microprocessor Products Group. Dr. Barrett will outline how he sees the market developing over the next six to 12 months, while Dr. Yu will describe the upcoming new technologies and products being developed to address specific market segments.

Tuesday's keynote presentations will be followed by a general session on Katmai Platform Architecture.

Tuesday's Technical Tracks:

- Optimizing AGP for the Katmai Platform
- Memory Designs for 1999 Platforms
- Performance Consumer Desktop Platform (Part I)
- Performance Business Desktop Platform (Part I)
- Technical Summary

Tuesday's Labs:

- IPEAK Storage Toolkit
- Mobile Power Measurement Tools
- Advanced Mobile PC Thermal Design
- I/O Scalability Analysis with IOMeter
- Smart Battery System Design and Specification Review
- IPEAK 1394 Toolkit
- Server Network Performance Analysis

Wednesday—September 16th

On Wednesday, Jon Miner, Corporate Vice President and General Manager of the Intel Enterprise Server Group, and Robert Jecman, Corporate Vice President and General Manager of the Intel Mobile and Handheld Products Group, will start the day off with keynote presentations. Jon Miner will examine recent advancements in processors and server platforms and Robert Jecman will describe the challenges involved in developing next-generation mobile platforms.

Wednesday's Technical Tracks:

- Performance Consumer Desktop Platform (Part II)
- Performance Business Desktop Platform (Part II)
- Server Platform Technologies (Part I)
- Mobile Platform Design Techniques (Part I)
- Embedded Technologies

Wednesday's Labs:

- Thermal Simulation and Measurement
- High-Speed Interconnect Validation
- IPEAK Graphics Performance Toolkit
- Entry-Level RAID Solutions
- High-Speed Interconnect Design
- High-Speed Clocking Workshop
- Proxy Cache Server Software Configuration and Optimization
- Thermal Simulation and Measurement
- VTune Software Performance Analysis Tool

Thursday—September 17th

Thursday's sessions begin with a keynote presentation by Patrick Gelsinger, Vice President and General Manager of the Intel Desktop Platform Group, who will review Intel's desktop platform strategy and outline where and how new technologies discussed at IDF will impact upcoming products.

Thursday's Technical Tracks:

- Putting Next-Generation Performance in Today's Desktop PC
- Designing a Basic PC
- Workstation Platform
- Server Platform Technologies (Part II)
- Mobile Platform Design Techniques (Part II)

Thursday's Labs:

- High-Speed Interconnect Validation
- WDM I/O Subsystem Performance Monitor (IOMon)
- Wired for Management 2.0 for Mobile PCs
- High-Speed Interconnect Design
- IPEAK Intel Power Management Analysis Tool (IPMAT)
- IPEAK Tools: DVD Qualification and Integration Kit (DQUIK) and Intel AGP Baseline System Evaluation Suite (IBASES)

Get a Taste of IDF

This month's *Platform Solutions* provides a sampling of what IDF attendees will experience. Some of the IDF content experts authored Top Stories to bring you a taste of the information presented at the forum. Here's a synopsis of the Top Stories in this issue.

Frank Hady, Senior Staff I/O Architect for Intel Architecture Labs (IAL), provides guidelines for optimizing Accelerated Graphics Port (AGP) performance in desktop platforms. Steve Brown, Intel's Strategic Manager for its Instantly Available Initiative, describes how new power-management specifications will help speed the convergence of the PC with consumer electronics.

Susan Redfern, Program Manager for the Intel Mobile and Handheld Products Group, summarizes the mobile platform design technologies presented at IDF. Michelle Chuaprasert, Mobile Platform Marketing Program Manager, describes the Intel® Mobile Power Initiative, and Clifton Laney, Mobile Wired for Management Program Manager, explains how remote wake-up capabilities are now available for mobile computers with or without docking stations.

Steve Krig, Intel Software Architect and IPEAK Tools Engineering Manager, introduces IOMon—a critical tool for the development of WDM drivers and integrated platforms. Brad Graff, Intel Product Manager, previews the new WTX form factor developed for midrange Intel Architecture-based workstations.

Steve Tolopka, Director of Intel's Managed Platform Lab, outlines how the latest release of the *Wired for Management Baseline Specification* enhances existing technologies and brings new capabilities to the platform.

For more information on the IDF tracks and presenters, check out the IDF Web site—
<http://developer.intel.com/design/idf/>

Top Stories

Mobile Platforms: The Vision Becomes a Reality at IDF

By Susan E. Redfern
Mobile Platform Marketing Program Manager
Intel Corporation

Mobile PCs continue to be the fastest-growing market segment of the PC industry. Increased performance and optimized power usage, improved affordability and manageability, and innovative advancements for anytime, anywhere computing are the keys to mobile computing's success. Intel and other leaders in the PC industry are providing real solutions to today's mobile computing challenges at the Intel Developer Forum (IDF). (<http://developer.intel.com/design/mobile/idf.htm>) IDF provides a unique one-stop-shopping source where developers can obtain all of the detailed technical information they need to implement the technologies and initiatives that are rapidly driving the evolution of the mobile PC.

Mobile @ IDF

This year's Mobile Track at IDF, "Designing Mobile platform solutions," is proving to fulfill its promise of technical depth and relevance to the mobile design community. Attendees have kicked off the mobile track by hearing keynote speaker Robert Jecmen (<http://www.intel.com/pressroom/kits/bios/jecmen.htm>), Intel Vice President and General Manager of the Mobile and Handheld Products Group (<http://developer.intel.com/design/mobile/>), describe the future of mobile computing (<http://developer.intel.com/design/idf/keynote.htm>) and the technical challenges that must be overcome to make this vision a reality. Mobile courses focus on important topics, such as the Mobile Power Guidelines (<http://developer.intel.com/design/mobile/intelpower/>), mobile manageability (http://developer.intel.com/design/mobile/wired_mgmt.htm), soft technologies for increased affordability, and "Bluetooth" technology (<http://developer.intel.com/design/mobile/bluetooth/index.htm>). Live mobile lab demonstrations provide a unique hands-on training experience. Attendees also have the opportunity to interact with PC system and component suppliers, magazine editors, and industry analysts as they debate important mobile computing issues like legacy removal, security, and DVD formats. Maintain your competitive advantage in the mobile PC industry by attending the next IDF!

Here is a sampling of this year's hot mobile topics:

No Compromise Performance with Optimized Power Management

In various power-focused courses, IDF attendees are discovering how Intel is responding to the challenges of the wide set of system requirements that must be addressed for mobile PCs, ranging from full-size notebooks to mini-notebooks. They are learning how CPU and graphics components are designed for high performance while being optimized for low power, and are acquiring the latest ACPI design (<http://developer.intel.com/design/mobile/acpi.htm>) and implementation techniques. In addition, they are discussing the extensive power-management work that is being done to make the IEEE 1394 bus (<http://developer.intel.com/technology/1394/>) a "mobile-friendly" bus and understanding the importance of USB, PCI, and CardBus Power Management. Finally, attendees have the opportunity to review the latest and greatest Smart Battery Specification.

In detailed mobile labs, IDF attendees are acquiring a comprehensive and informative review and demonstration of Intel's power management tools (<http://developer.intel.com/design/mobile/intelpower/tools/index.htm>) such as the Intel® Power Monitor (software) (<http://developer.intel.com/ial/ipm/>), Intel Power Analyst (hardware) (<http://developer.intel.com/design/mobile/intelpower/tools/ipa/index.htm>), and the Intel Power Management and Analysis Tool (<http://developer.intel.com/design/ipeak/>) (ACPI power management (<http://www.intel.com/mobile/techforum/acpimen.htm>)). These tools can measure system, device, and application power consumption and functionality.

Mobile's ever-popular thermal lab is also being offered, giving participants the opportunity to review thermal test procedures, design concepts, and ACPI as it relates to CPU thermal control. Intel's thermal

testing process, recommendations for maximizing remote heat exchange efficiency, and a discussion of thermal design bottlenecks are also included in this lab.

Intel has just announced that version 0.8 of the Intel Mobile Power Guidelines 2000 (<http://developer.intel.com/design/mobile/intelpower/index.htm>) is available for public review. These guidelines include new features and capabilities available in year 2000 full-size and mini-notebook systems. You can provide feedback on the guidelines at this e-mail address: power@intel.com. For a detailed look at the latest additions to the Intel Mobile Power Initiative (<http://developer.intel.com/design/mobile/intelpower/index.htm>), including Intel Mobile Power Guidelines 2000, see *The Intel Mobile Power Initiative: Raising the Performance Bar* (<http://developer.intel.com/solutions/issue/stories/top7.htm>) by Michelle Chuaprasert in this issue of *Platform Solutions*.

Affordable Mobile Computing

IDF attendees are discovering how to design cost-effective mobile computing solutions. Mobile courses and labs at IDF describe performance, features, and design recommendations based on Intel mobile processor and chipset solutions for the basic and mini-notebook marketplace. Comprehensive discussions include implementation strategies for cost, power, and space reduction and cover soft technologies like soft audio and soft modem. Soft technology represents a valuable implementation strategy to reduce cost, conserve power and save board space. Using soft audio and soft modem technologies to replace hardware components can significantly reduce materials expenditures and design costs in basic and mini-notebook PCs.

Ultra-Manageable Mobile Computing

Managing mobile PCs has become a key issue for business users and IT managers. According to Dataquest's* first quarter 1998 report, mobile PCs now comprise 19.6 percent of all business PC shipments. Wired for Management (WfM) (http://developer.intel.com/design/mobile/wired_mgmt.htm) adds enhanced manageability to mobile PCs with the new release of the WfM 2.0 specification. IDF attendees are learning the latest on how to build a WfM 2.0 enabled system and are seeing live demos of strategic new technologies: Wake on LAN* (WOL) from CardBus LAN adapters, Preboot Execution (PXE) (<http://developer.intel.com/ial/wfm/tools/pxe/index.htm>) from CardBus, LAN on Notebook (LON), thermal sensors, and WfM instrumentation. In addition, the Intel DMI CI SDK (http://developer.intel.com/ial/wfm/tools/imci_sdk/index.htm), PXE SDK and compliance test are also being demonstrated.

For more information on WfM for Mobile, including the WOL capability, see *Remote Wake-Up Comes to Mobile Computing* (<http://developer.intel.com/solutions/issue/stories/top2.htm>) by Clifton Laney in this issue of *Platform Solutions*.

Anytime, Anywhere Computing

Visionary mobile courses and labs are making the promise of true anywhere, anytime computing a reality. Developers are learning how Bluetooth technology (<http://developer.intel.com/design/mobile/bluetooth/index.htm>) enables wireless connectivity between mobile phones, mobile PCs, handheld computers, and other peripherals, and are finding out about the Bluetooth Special Interest Group (<http://www.bluetooth.com/vercert/index.asp>). Bluetooth technology is a revolutionary short range radio link technology which replaces cables and is optimized for mobile devices and environments. Bluetooth's low-power consumption and low-power modes meet the mobile power requirements by using less than 0.1W active power. Since Bluetooth is designed for both computing and communications applications, it also plans to support high-quality voice and data and robust data transfer rates, including simultaneous voice/data.

Conclusion

The Intel Developer Forum (<http://developer.intel.com/design/idf/>) is the best way for mobile PC developers, hardware, and software vendors to hit the moving target of rapidly evolving mobile platform technologies. Since its inception, IDF has emerged as the premiere technical conference in the mobile industry, enabling developers to transform forward-looking technologies into next-generation products.

Next Steps

Mobile PC OEMs, hardware and software developers should obtain the latest information on the initiatives and technologies driving the evolution of the mobile platform. The best way to do this is to make plans now to attend the next Intel Developer Forum. Attendance at IDF has become a “must” for the mobile industry.

About the Author:

Susan E. Redfern is Platform Marketing Program Manager in Intel's Mobile & Handheld Products Group where she manages the development and implementation of mobile software initiatives that enable software developers to design applications that work well anywhere, anytime.

For More Information:

Checkout the Intel Developer Forum—<http://developer.intel.com/design/mobile/idf.htm>

WTX: A Flexible Workstation Form Factor

By Brad Graff
Product Manager
Intel Corporation

In the PC design space, familiar form factors such as ATX and NLX enable a high level of standardization. Developers benefit from simplified design methodology, shorter time to market, and the promise of reduced costs for OEMs, system integrators and PC users alike. Until now there have been no such well-defined and widely accepted form factors for suppliers and their customers in the growing Intel® Architecture-based workstation space.

Today's PC form factors will be inadequate to support the special requirements of workstations within two years at the most. These special needs include dual-processor configurations, heavy-duty power demands, more powerful graphics, and advanced I/O requirements. Unless off-the-shelf standardized workstation components become available, the only alternative for OEMs will be to spend money and time designing custom solutions.

To enable the industry to overcome these barriers and expand the workstation market segment, Intel is announcing WTX—a new, flexible and extendible form factor for mid-range Intel Architecture-based workstations. Developed in association with leading industry vendors, the WTX form factor enables developers of Intel Architecture workstations to specify standardized power supplies, chassis products and motherboards as off-the-shelf components. This enables developers to devote their engineering and budgetary resources to value-added features and shorter development cycles.

WTX: Flexible and Extendible

To create the form factor, Intel conducted a thorough technical dialog with leading workstation OEMs and chassis, motherboard, and power supply vendors. Detailed feedback enabled Intel to author a volumetric specification with the flexibility to meet a variety of workstation configuration needs. WTX is also designed for extendibility to accommodate new technologies, including advances in IA-32 and IA-64 processors and chipsets for the next three to five years.

Impressive Industry Support

WTX has already received widespread industry support from leading workstation OEM's, motherboard manufacturers, power supply vendors, and chassis vendors. OEM's that helped develop the specification and are general supporters of WTX include IBM, Compaq, Dell, Intergraph, UMAX, and Gateway.

Based on the WTX 1.0 specification, the following companies have committed to shipping WTX-compliant products in 1999:

- Workstation OEMs: HP, SNI, NEC, and Fujitsu
- Board Manufacturers: Tyan, SuperMicro, Acer, and AsusTek
- Chassis and Power Supply Manufacturers: Loyalty Founder, Liteon, Enlight, Chenbro, and SuperMicro

Benefits for Developers

For developers, the immediate benefit of WTX will be to eliminate the need to continually modify their motherboard and chassis designs. The new form factor will also enable workstation OEMs to announce new products on the same day that new processors are introduced.

The new WTX form factor benefits developers in a number of key areas:

- Workstation graphics—WTX supports the power, volume and thermal dissipation requirements of the AGP Pro graphics specification.
- Differentiated peripherals—the specification allows OEMs to vary their front panel and bay configurations to meet the needs of specific customers.
- Ample I/O and expandability—seven standard expansion (i.e., PCI and AGP) slots are provided for expandability, including an additional "Flex Slot" capable of supporting a riser card with I/O such as LAN, SCSI, audio, PIIX, IEEE 1394, flash and super I/O adapters—all integrated on a single card.

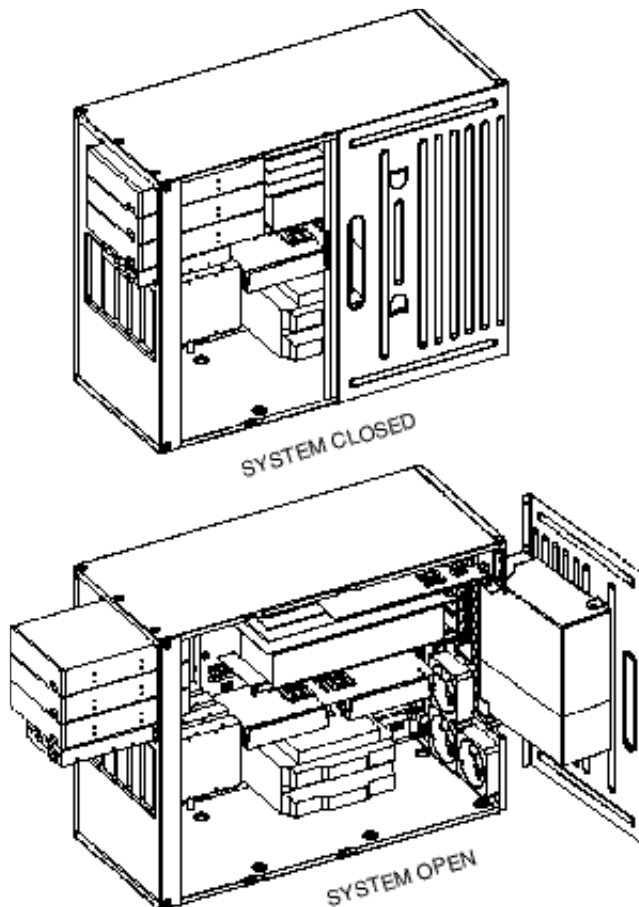
Alternatively, in place of the riser card, WTX can accommodate two additional expansion slots bringing the total to nine expansion slots.

- Office environmental factors—the specification enables the design of systems to meet office environmental requirements for noise, EMI, power consumption, and physical size.
- Volumetric specification—WTX is a volumetric specification with separate zones available for processors, memory, graphics and I/O and the integrated “Flex” I/O riser card. Each zone is designed to accommodate future advances in specific platform building blocks.
- Thermal zones—WTX includes a volumetric specification of distinct thermal zones that allows variable fan speed control and minimizes cooling requirements per zone.

Special Adapter Plate Adds Even More Flexibility

The presence of mounting holes in traditional PC motherboards can create frustration for designers—there always seems to be a hole where a component needs to go. The WTX design avoids this problem by means of a special low-cost adapter plate that resides between the motherboard and the chassis, attaching to the chassis with five special snap mechanisms.

Multiple adapter plate configurations will be usable, giving OEMs the freedom to place components where they need to be. Board manufacturers are responsible for shipping the adapter plate with their motherboard. As with the current ATX PC form factor, board vendors are also responsible for supplying the appropriate I/O shield.



A typical WTX-compliant system

Intel's Role

Intel is working to enable a WTX-compliant chassis and make it available to the industry by mid-1999. This effort includes enabling the design of WTX motherboards, power supplies, I/O shields, and adapter plates.

Conclusion

Standard PC-based form factors cannot continue to support the special requirements of workstations. The new WTX form factor provides a standardized blueprint for Intel-based midrange workstations for the next three to five years. This is a widely supported industry specification that offers significant benefits, including more design flexibility, reduced design costs and shorter time-to-market. Most importantly, the WTX form factor enables the industry to expand an important market segment—Intel Architecture workstations.

Next Steps

Component vendors should become familiar with the WTX specification and plan to meet the demand for WTX-compliant products in 1999.

OEMs should obtain a copy of the WTX form factor specification and work with component suppliers to support their WTX product designs in 1999.

About the Author:

Brad Graff is a product marketing manager for mid and high-end Intel Architecture Workstations in Intel's Workstation Product Division where he currently focuses on next-generation workstation system packaging strategies.

For More Information:

Download the preliminary WTX Specification—www.wtx.org

Questions?: E-mail the WTX team at wtx@intel.com.

Read the latest information about workstations powered by the Intel® Pentium® II Xeon™ processor—www.intel.com/PentiumII/xeon/home.htm

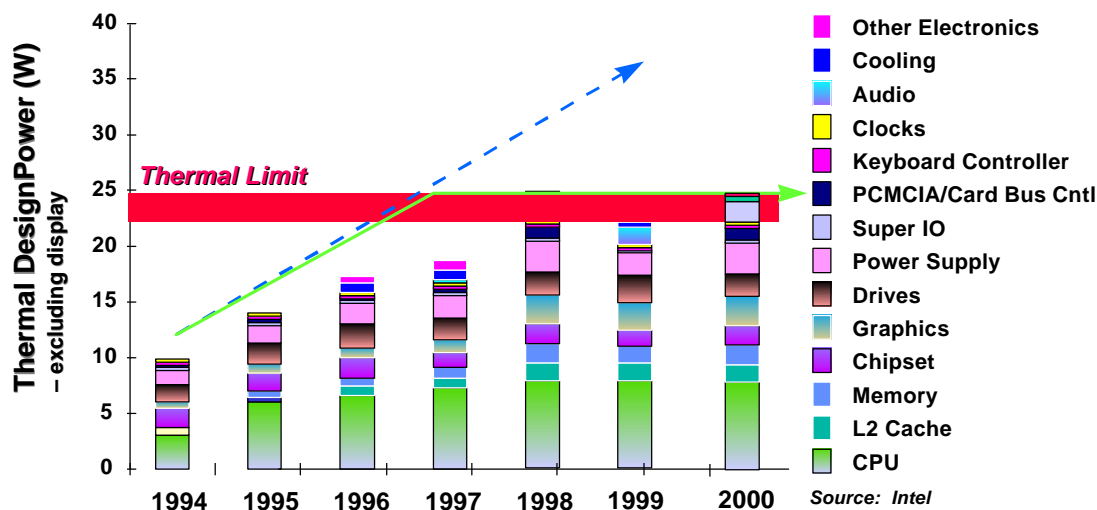
Get the latest on Intel Architecture-based workstations—www.intel.com/businesscomputing/wrkstn/index.htm

Download the AGP Pro Specification—<http://developer.intel.com/pc-supp/platform/agfxport/INDEX.HTM>

The Intel Mobile Power Initiative: Raising the Performance Bar

By Michelle Chuaprasert
Mobile Platform Marketing Program Manager
Intel Corporation

Mobile PCs are getting smaller, thinner, and lighter. While form factors are shrinking, next-generation mobile PCs are expected to deliver no-compromise performance, advanced features, and support for new applications. At its current rate of growth, mobile PC power consumption will rapidly exceed the thermal dissipation capabilities of mobile form factors. Moreover, escalating power demands will also impact the mobile platform by reducing usable battery life. In order to keep pace with the evolution of mobile PC performance, developers should use the latest elements of the Intel® Mobile Power Initiative in their upcoming design cycle.



Notebook Power Trends

The Intel Mobile Power Initiative at IDF

The Intel Mobile Power Initiative is a comprehensive industry-wide program that provides mobile PC manufacturers, component manufacturers, and software vendors with the guidelines, tools, and resources they need to develop high-performance, feature-rich and power-efficient mobile PCs. The initiative focuses on three key areas:

- System Hardware—designing systems that meet the Mobile Power Guidelines
- System Software—transitioning to ACPI-enabled operating system-directed power management
- Application Software—designing power-efficient applications

Attendees of the latest Intel Developer Forum (IDF) on September 15–17 received a thorough introduction to the latest elements of the Intel Mobile Power Initiative, including the new Intel Mobile Power Guidelines 2000 (v.0.8). These guidelines include specific recommendations for developing high-performance, power-efficient mobile PCs within existing thermal design limits. The new guidelines are the next generation of the Intel Power Management Guidelines '99 that were announced at Intel's Mobile Power Symposium in September 1997. The current information discusses how to increase performance and capability of a full-size system while holding system power flat going into the year 2000, and also describes the power targets for mini-notebook PCs.

The Intel Mobile Power Initiative is already showing positive results:

- Leading mobile PC OEMs have used Intel's implementation workshops, tools, and guidelines to help them deliver systems that are compliant with the Advanced Configuration and Power Interface (ACPI).
- Software vendors have also used the Intel Power Monitor and associated software guidelines to make dozens of their applications power-efficient. The result is that many leading applications, such as Microsoft* and Lotus* office suites, allow users to enjoy longer battery life while using them.

Guidelines and Tools for Developers

Intel has developed many tools and guidelines that will benefit component, system, and software vendors in their efforts to develop power-efficient products. Following is a sampling of them:

- System hardware guidelines—the Intel Mobile Power Guidelines 2000 (v0.8) released at IDF enables the development of power-efficient, high-performance mobile PCs in a variety of emerging form factors.
- System software tools—Intel is providing the tools needed to optimize a system for ACPI and OS-directed power management, to deliver maximum benefit from this next-generation technology. Intel's Power Analyst Tool measures power consumption of individual components, enabling platform developers to optimize system-wide power management. The Intel Power Management and Analysis Tool (IPMAT) has a new "mobile mode" enabling measurements to be taken while the system is running on battery power.
- Application software tools—Intel Mobile Application Software Guidelines provide recommendations for power-friendly software. The Intel Power Monitor (IPM) shows the impact of individual applications and the operating system on power consumption. Numerous applications are now power-friendly, including: Microsoft Office 2000, Visible Decisions, Inc.* VizIT in 3D, Globalink* Power Translator Pro 6.4, and many others. IPM (v3.1) has been updated to support Windows* 98 and ACPI.

Intel Contributions

In addition to leading the Mobile Power Initiative, Intel delivers products that meet the Mobile Power Guidelines. For example, Intel just announced the higher-performing Pentium® II processor at 300 MHz at the same power as previous processors. Intel is also providing the industry with lower-power processors that enable higher levels of performance in new mobile form factors. An example is the mobile Pentium processor with MMX™ technology at 266 MHz, designed for mini-notebook applications. Intel processors and chipsets support ACPI.

By continuing to advance the Intel Mobile Power Initiative and by delivering processors, chipsets, and tools that enable high performance with low-power consumption, Intel is working to ensure that tomorrow's mobile platforms can be developed at the same power limits as today's.

Next Steps

The Mobile Power Guidelines 2000 (v0.8) has been posted on the Web for industry review. Get involved with the development of this valuable resource by providing input for its final release, scheduled for December '98. You can provide feedback during the response period (September 16 to October 2) by sending e-mail to power@intel.com.

Whether you are a mobile PC component or system manufacturer, or a BIOS or application developer, you can participate in Intel's Mobile Power Initiative to help deliver products that meet the design challenges facing mobile systems. With your participation, future mobile systems will provide the performance, features, and power-efficiency that users demand.

About the Author:

Michelle Chuaprasert is Platform Marketing Program Manager in Intel's Mobile and Handheld Products Group. She also works with leading operating system vendors and software developers to provide operating systems and applications using the latest power-management techniques.

For More Information:

For information on the Intel Mobile Power Initiative see the Mobile PC Power Technology Forum (<http://www.intel.com/mobile/techforum/power.htm>) Web site.



Technical information and the latest Mobile Power Guidelines 2000 are available at the Mobile Power Initiative (<http://www.intel.com/design/mobile/intelpower/>) Web site.

The ACPI specification (<http://www.intel.com/mobile/techforum/acpimen.htm>) is available at the Mobile ACPI Web site.

Information about the Smart Battery System (SBS) (<http://www.intel.com/mobile/techforum/sbsmen.htm>) is available at the SBS Web site.

Read about the Intel Power Analyst. (<http://developer.intel.com/design/mobile/intelpower/tools/ipa/>)

Check out the latest developments on IPMAT (<http://www.intel.com/design/ipeak/pwrtool/>).

Read the latest information on the Intel Power Monitor (IPM) (<http://www.intel.com/ial/ipm/>).

Read the "Recommendations to Windows* 95 Application/Driver Developers for Writing Power Friendly Software" (<http://www.intel.com/ial/ipm/w95app.htm>) applications note.

IPEAK I/O Monitor: Easing the Transition to WDM

By Steve Krig
Staff Software Engineer
OEM Platform Solutions Division
Intel Corporation

The new Win32* Driver Model (WDM) substantially increases the portability of drivers across Microsoft* operating systems—including Windows* 9x and Windows NT*—while making it much easier to code drivers. Introduced in Windows 98, WDM will be the primary building block for software that supports emerging technologies at the device level for the foreseeable future. In fact, Microsoft's upcoming release of Windows NT 5.0 will employ WDM extensively.

But the many advantages of WDM are tempered by new challenges when it comes to writing drivers for the PC platform. That's because at run time, WDM incorporates a distinct hierarchy of drivers between hardware components and software applications. Often written by many different vendors, these drivers—which include device mini-ports, filter drivers and bus-class drivers, to name a few examples—use I/O Request Packets (IRPs) to translate application-level requests into device or bus-level action. Drivers forward IRPs through the WDM driver hierarchy until a particular driver recognizes itself as the target for the request.

The problem is that any driver has the potential to be adversely—and transparently—affected by its neighbors above and below it in the driver hierarchy. As WDM drivers cooperate at the integrated platform level, latencies for one bus can translate into lost data or poor performance for devices on a separate bus. And because the WDM architecture is so new, few tools are available to debug and tune drivers that are written for it.

IOMon: In the Driver's Seat

It's extremely important that driver writers and platform integrators have the ability to assess the impact of a driver on its neighbors in the WDM hierarchy. Driver writers need a way to monitor I/O performance and functionality while developing code for the WDM model. And platform integrators need to monitor how applications affect the I/O activity of buses and devices that must compete through the WDM driver stack for host processing power. That's where Intel's WDM I/O Subsystem and Performance Monitor (IOMon) can help.

IOMon is one of the newest members of the Intel® Performance Evaluation and Analysis Kit (IPEAK) family of tools. As with all IPEAK tools, IOMon has been designed to ease the transition to new technologies and initiatives in a way that accelerates their integration into the next generation of desktop, mobile, workstation, and server platforms. Introduced at September's Intel Developer Forum in conjunction with the new DQUICK (DVD Qualification and Integration Kit) and 1394 toolkits, IOMon provides OEMs and IHVs with a critical tool to help them develop their drivers and integrated platform solutions.

The IOMon Advantage

IOMon identifies functional defects and performance bottlenecks related to WDM drivers—acting, in essence, like an X-ray for platform I/O. It alleviates many of the difficulties associated with debugging drivers within an integrated system by providing IHVs, OEMs, and ISVs with a number of key capabilities.

First of all, IOMon enumerates and displays information about all devices and buses in the PC, including bus-class and peripheral device drivers, and spanning such technologies as PCI, USB, and 1394. It differentiates between physical and logical devices, and enables any device or bus to be monitored—either separately, or in conjunction with other devices.

IOMon allows users to select and view specific IRPs received by the computer's device drivers. Regardless of what particular application is run, IOMon is able to capture the driver/device-level activity initiated by that application. It captures the very lowest level of detail, including the parameters and

return statuses associated with specific IRPs. This makes it easy to identify defects due to improper control and data exchange between applications and devices.

In addition, IOMon measures latencies associated with I/O requests—specifically, the time it takes for them to be processed by the driver. IOMon is also capable of providing absolute time stamps for I/O requests. The latency measurement, combined with the absolute timing, allows performance bottlenecks to be identified at the driver IRP processing level. Latencies are a good indication of where a driver or device may be taking too long to process a request. Absolute timing values are useful for identifying where an application request may be taking too much time to get into a particular driver. Latency measurement and absolute time values combine to form a highly useful feature for identifying performance bottlenecks throughout the platform I/O stream.

Driver Education

It's clear that poorly written drivers effect the overall performance and functionality of the platform. But with WDM, even well written drivers can “stack” to form an integrated platform I/O driver stream that does not perform or function well. IHVs and OEMs can't debug code they do not own—IOMon can help by providing real-time monitoring capabilities throughout the WDM driver “stream” without requiring source for individual drivers. As the latest addition to the IPEAK family of tools, IOMon is ideal for WDM driver/device debug and analysis, placing OEMs and IHVs squarely in the driver's seat on the road to new performance horizons on the PC platform.

About the Author:

Steve Krig is a staff software engineer in Intel's OEM platform solutions Division. He serves as the development engineering manager for the Intel Performance Evaluation and Analysis Kit (IPEAK). Steve is also software architect for several recent IPEAK tool additions including IOMon, 1394 ToolKit, and IBASES.

For More Information:

IOMon is available now. For more information about IOMon and how to order it, please check out the IPEAK Web site—<http://developer.intel.com/design/ipeak>

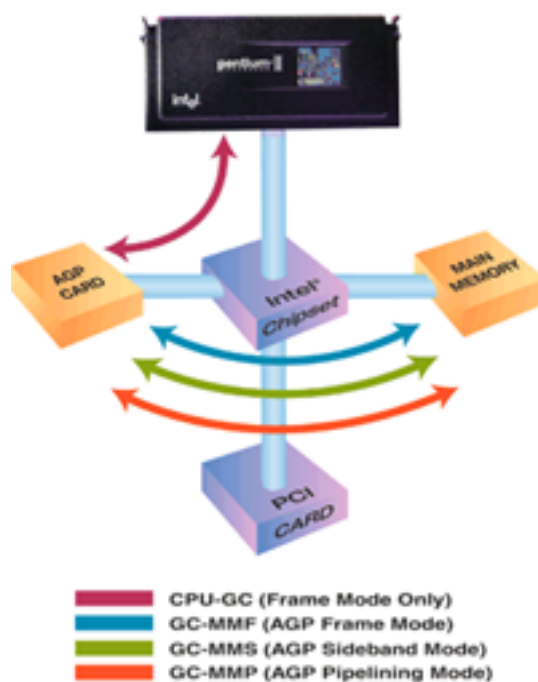
Maximizing AGP Performance in Desktop PCs

By Frank Hady
Senior Staff I/O Architect
Intel Architecture Labs

The Accelerated Graphics Port (AGP) enables a new level of graphics realism on the PC. As AGP enabled platforms become a significant portion of the installed base, leading software developers are adding new graphics content to their applications. With more content, graphics-intensive applications will continue to demand additional performance from the PC platform. High AGP bandwidth is a central ingredient of excellent PC graphics performance. To maximize the performance of AGP, platform developers should obtain and follow these performance guidelines.

AGP Data Movement Modes

The execution of 3D graphics applications requires the movement of texture data, geometry data and commands across AGP to the graphics controller. To accomplish this, AGP offers a variety of paths and modes.



Data Movement Paths and Corresponding AGP Modes

Data written or read directly to or from the graphics controller is represented by the **CPU-GC** path. This path is typically used for CPU writes of geometry data and command lists to a memory-mapped region on the graphics card. According to the AGP 1.0 specification, data moved along this path must cross AGP using Frame Mode (PCI protocol).

Data written or read to or from main memory is typically texture data, geometry data or command lists stored in main memory. This path offers three mode choices: Frame Mode (**GC-MMF**), Pipelining Mode (**GC-MMP**) and Sideband Addressing Mode (**GC-MMS**).

Each mode offers a unique feature set and level of AGP performance. Frame Mode offers baseline performance using the PCI protocol. Pipelining Mode offers higher performance, and Sideband Addressing Mode offers the highest level of performance.

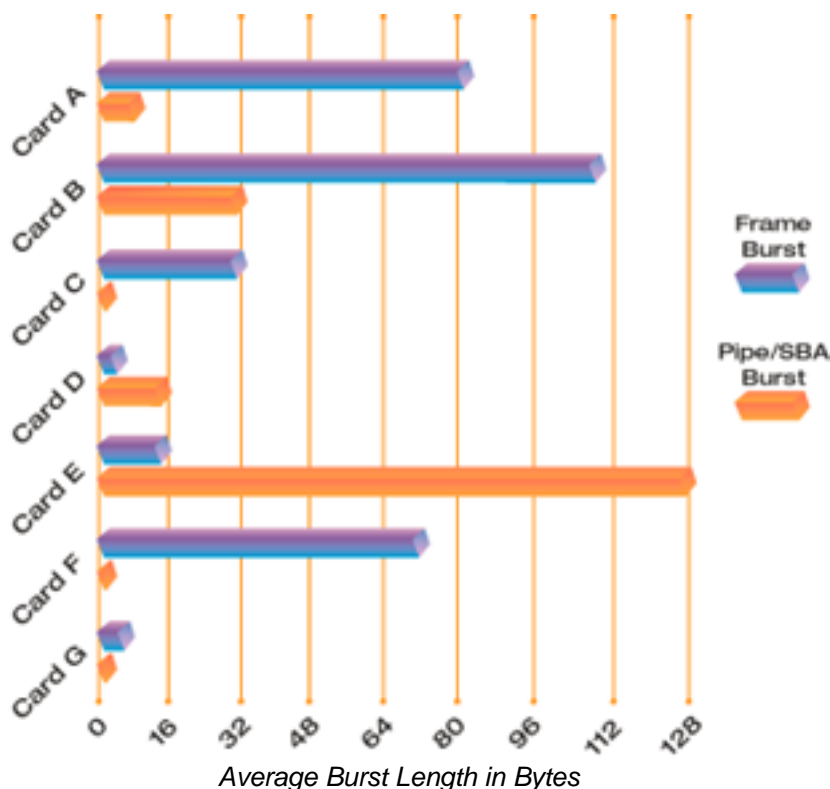
- **CPU-GC Frame Mode**—The AGP 1.0 specification allows only one master for AGP Pipelining and

Sideband Addressing. Since this master is the graphics controller, only Frame Mode is available for moving data directly from the CPU to the graphics controller.

- **GC-MMF AGP Frame Mode**—This mode uses the PCI protocol to provide baseline performance for main memory reads and writes from the graphics controller. The higher bus frequency allows data transfers at 264 MB/s, or twice the throughput of shared 33-MHz PCI.
- **GC-MMP AGP Pipelining Mode**—AGP Pipelining offers higher performance by using the PIPE# signal of the AGP protocol to create multiple outstanding transactions, eliminating the bandwidth degradation due to round-trip time to main memory. Pipelined transfers are not coherent with the CPU's cache, so reads or writes are not delayed while the CPU caches are snooped to see if they contain the most recent copies of data being read or written. In a system with high AGP traffic, non-coherent transfers avoid heavily loading the system bus and allow data to be transferred more quickly to or from the graphics controller.
- **GC-MMS Sideband Addressing Mode**—This mode offers the highest level of AGP performance. In addition to allowing multiple outstanding transactions and non-coherent access to main memory, Sideband Addressing introduces a separate address/command bus, the Sideband Address Port (SBA). Because the SBA and data buses are not multiplexed, the graphic controller can use the SBA to make data requests without interrupting the data bus.

Pipelining and Sideband Addressing each offer two data rates—1X (66 MHz, 264 MB/s) and 2X (133 MHz, 528 MB/s). AGP Frame Mode can use only the 1X rate. At the cost of more high-speed board signals, the 2X rate almost doubles available bandwidth.

Designers will choose from AGP Frame Mode, Pipelining Mode, and Sideband Addressing Mode based on features, performance and cost. A survey of a number of currently available graphics controllers conducted at Intel Architecture Labs showed that the Frame and Pipeline/Sideband burst performance of these products spans the AGP specification.



To maximize AGP performance, designers should move from Frame Mode to Pipelining and Sideband Addressing wherever possible.

To Minimize AGP Latency, Maximize Throughput

Designers are rightfully concerned about minimizing AGP latencies. The way to accomplish this is to maximize throughput. Pipelining AGP data requests eliminates AGP idles. For pipelined requests, throughput determines latency, as shown in the examples below:

- Example 1: in a case of a 10-KB texture fetch with AGP throughput of 500 MB/s and pipelined accesses, latency is equal to the idle bus latency plus 10 KB/500 MB/s—or 20 μ s.
- Example 2: in a case of the same 10-KB texture fetch with AGP throughput of 250 MB/s and pipelined accesses, latency is equal to the idle bus latency plus 10 KB/250 MB/s—or 40 μ s.

Designers should also bear in mind that higher performance chipsets deliver low AGP latency and tighter latency distribution. For example, the Intel® 440BX AGPset is an optimized second-generation chipset that delivers more main memory bandwidth and tighter AGP latency distribution than first-generation AGPsets.

Updated AGP Guidelines Now Available

Design guidelines for maximizing AGP performance in Frame Mode, Pipelining Mode and Sideband Addressing Mode were initially presented at the Intel Developer Forum in September 1997. Updated guidelines are now available. A summary discussion of the benefits of using the guidelines is available from the Accelerated Graphics Port Implementors Forum. (<http://www.agpforum.org>)

Conclusion

AGP provides graphics controllers with high-performance access to main memory. Richer application content is driving the need for higher throughput and utilization.

The AGP performance guidelines enable designers to maximize command throughput and minimize texture fetch latency. As application content loads continue to increase, following the AGP performance guidelines will soon become critical for good graphics performance. It is equally important to design to the highest performance region offered by the chipset. Intel offers designers the chipset information and design methods needed to create high-performance low-level code.

Next Steps

For optimum AGP performance:

- Designers should obtain and follow the latest guidelines for graphics controller hardware/driver implementation.
- OEMs should select chipsets that support all AGP data movement modes and options.
- Graphics controller vendors should move up to higher-performance AGP modes to meet growing application bandwidth requirements.

About the Author:

Frank Hady is a staff engineer in the I/O Architecture and Performance Group of Intel's Platform Architecture Labs where he works to characterize and improve the performance of I/O technologies. Frank's current focus is PCI and chipset performance.

For More Information:

For a detailed discussion of AGP Performance guidelines, download the white paper *Maximizing AGP Performance* from the Accelerated Graphics Port Implementors Forum Web site. (<http://www.agpforum.org>)

Additional information is including information on AGP Plugfests, current versions of AGP specifications, and white papers.

PC Design and the Power-Management Challenge

By Steve Brown
Strategic Initiatives Manager
Intel Platform Marketing

At this month's Intel Developer Forum, developers learned how to design power-managed products that provide deep sleep and quick system resume features, based on Intel's Instantly Available technology. The focus of the two main sessions that covered Instantly Available technology was implementation of both the hardware and software pieces needed to build a deeply power-managed PC. The sessions included discussion of the trade-off involved between power supply- and motherboard-based solutions 10 tips and tricks for implementation of Instantly Available platforms using the Intel® 440BX chipset, as well as recommendations for next-generation designs featuring Direct RDRAM. The need for power budgeting software was also covered, along with a great deal of discussion in breakout sessions on the interactions among hardware, firmware, and the operating system during suspend/resume cycles.

The convergence of PCs and consumer electronics is creating new challenges for system designers. That's because consumer electronics devices are always immediately available for use, typically spending most of their time in a low-power standby mode. As the PC merges with such consumer electronics systems as telephones, CD players, VCRs, TVs, and DVD players, developers need to provide the same kind of immediate availability and utility characteristic as these devices.

At the same time that consumer PCs and electronics devices are merging, today's business PCs are moving into an era of Constant Computing, changing from 8-hour-a-day tools into personal assistants that can work around the clock to keep people current with the information they need for their jobs. Soon, smart agents will gather data across the Intranet and the Internet, and data will be shared with co-workers by hosting personal Web pages on the desktop. These tasks will require 24-hour availability, delivered by implementing a comprehensive power-management scheme that allows the PC to wake-up whenever it needs to perform a task.

Inside Instantly Available Technology

Power management is the essential final piece needed to accelerate the convergence of the PC with consumer electronics and to propel us all into the age of Constant Computing. Meeting new power-management design challenges requires a substantial change to PC design based on open specifications that can help deliver robust, cost-effective, and interoperable products to customers.

Instantly Available technology is based upon the S3 (Suspend to RAM) state of the Advanced Configuration and Power Interface (ACPI) specification. Intel's surrounding initiative supports the industry in designing power-managed products that feature deep sleep and quick system resume capabilities. Low power consumption (typically 5–10 W) is made possible by switching off everything in the system other than memory (which is placed into self-refresh mode), the chipset, and a trickle current to a pin on the PCI bus.

Dual-Mode Voltage and the S3 State

In an Instantly Available PC, this trickle current is supplied to wake devices—such as a network interface or modem—enabling them to wake-up the system when they receive some kind of external stimulus. This requires the generation of a dual-mode voltage that is routed on a separate power plane to the memory, on-board wake devices, and the 3.3 V_{aux} pin of each PCI slot. The dual-mode voltage ensures that devices receive uninterrupted power, and can efficiently draw high current when fully operational and low current when in suspend mode. The dual-mode voltage can either be generated in the power supply or on the motherboard from existing standard supply rails such as 3.3 V_{main} and 5 VSB.

Designers need to take considerable care over how they generate this dual-mode voltage, and also how they control the various reset, clock, and ACPI control signals during the suspend and resume process. These were discussed in detail at the developer forum, but will also be covered in an update to the Instantly Available Design Guide, to be posted on the Instantly Available Web site—<http://developer.intel.com/technology/iapc/>—in the coming weeks.

PCI and AGP add-in card designers should be sure to build in support for the D3_{cold} power state defined by the PCI Power-Management specification and required for add-ins to participate in S3-based power management. Since power is removed from AGP and PCI devices during the S3 state (except for 3.3 V_{aux}), drivers need to be written that save the card's state when the operating system issues a suspend command, and then restore that state when the system resumes. This applies equally to wake devices—such as modems and network cards—as it does to their non-wake counterparts, like graphics, audio, and SCSI devices.

Opportunities for Innovation

In the future, additional dual-mode voltages will be required to enable USB wake-up devices (5 V_{dual}), and to supply next-generation memory technologies such as Direct RDRAM (2.5 V_{dual}). These voltages can either be generated on the motherboard or within the power supply. Motherboard designers will need to come up with new ways to reduce cost of the circuitry needed to generate these voltages, and new ASICs will be required that drive costs down for power supply manufacturers.

About the Author:

Steve Brown is a strategic initiatives manager in Intel's Platform Marketing group, where his responsibilities include all efforts to enable OEMs to bring products to market that take advantage of Intel's Instantly Available technology.

For More Information:

Check out the Instantly Available Web site—developer.intel.com/technology/iapc/—for more information on Instantly Available technology, including links to the PCI Bus Power Management Interface Specification, the 3.3 V_{aux} ECR for the PCI Local Bus Specification, rev. 2.1, the ACPI 1.0 Specification, and other useful technical resources.

Download the PC 99 System Design Guide—<http://developer.intel.com/design/desguide/>

WfM Baseline Specification v2.0 Extends PC Management Capabilities

By Steve Tolopka
Director, Managed Platform Lab
Intel Architecture Labs

The broad adoption of the Wired for Management (WfM) Baseline v1.1 has had a significant effect in helping companies gain control of their computing environments, increase their business flexibility, and reduce total cost of ownership (TCO) of their computing resources by providing centralized management capabilities for desktop and mobile systems. WfM v2.0 builds upon this foundation by enhancing the four basic management capabilities addressed in the existing specification—system component instrumentation, universal network boot, power management, and remote wake-up—while adding streamlined help desk support capabilities.

As a driving force in creating and developing the WfM initiative, Intel has continued to evolve the specification, working closely with over 30 companies across the industry—including OEMs, IHVs, BIOS and operating system vendors, management software suppliers, and help desk application vendors. The latest version of WfM raises the Baseline capabilities of the business computing platform while supporting other Intel co-authored specifications and design guides such as the PC 99 System Design Guide, the Windows Hardware Instrumentation Implementation Guide, and the Server Hardware Design Guide for Windows NT* 5.0, to name a few prominent examples.

Where DMI Meets WBEM

One of the main enhancements provided by WfM Baseline v2.0 is in the area of system component instrumentation. The new specification continues to promote Desktop Management Taskforce (DMTF) standards, augmenting existing support for the Desktop Management Interface (DMI) with support for the newer Common Information Model (CIM). WfM Baseline v2.0 provides for a smooth transition between the two instrumentation models by ensuring that DMI-based component instrumentation is available to CIM-based management applications, and CIM-based component instrumentation is available to DMI-based management applications.

As a standardized data model for object-based management technologies, CIM enables data from various system elements to be viewed and managed in a unified manner. Equally significant, CIM support paves the way for use of Web-based Enterprise Management (WBEM) in WfM-enabled systems. WBEM provides management applications with uniform access to management information from sources that include DMI, Simple Network Management Protocol (SNMP), and operating-system-specific component instrumentation.

Universal Network Boot, Power Management, and More

WfM Baseline v2.0 offers several enhancements relating to boot features including an improved architecture for the Pre-Boot eXecution Environment (PXE). The updated architecture supports universal network boot via CardBus adapter cards, allowing the rapidly growing segment of mobile users to now benefit from remote installation of software and remote diagnosis of system problems. In addition, new Boot Integrity Services enable downloaded boot images to be authenticated using digital signature technology. As a result, IT managers can use image authentication to ensure that systems booting from the network use only boot images that are IT-approved.

The new Baseline also eases the task of help desk IT professionals with an automated Trouble Ticket Agent that supports the Solution Exchange and Service Incident Exchange standards developed by the DMTF and Computer Support Consortium. This enhancement provides a way to gather and track instant and accurate information relating to client/server problems across the enterprise.

There's more. WfM Baseline v2.0's remote wake-up capability brings the benefits of the Instantly Available PC to managed desktop and mobile computing platforms, incorporating features such as power-managed network adapters and "wake on ring" technology. Other enhancements of note include expanded platform information available through an updated system management BIOS, notification of Platform Events via SNMP traps, and support for remote management applications that need to lock a system's keyboard and mouse during sensitive operations. Look for more details on these and other WfM Baseline v2.0 features in upcoming editions of Platform Solutions.

Product Development Efforts Underway

Products incorporating the new and enhanced WfM Baseline v2.0 specification are anticipated to be available beginning in Q2 1999, with management applications for those systems expected to appear in the same time frame. WfM-enabled systems and software currently available will be fully compatible with new systems and software, enabling IT managers to easily build upon their current WfM configurations.

In addition, new development tools and enabling products that support WfM v2.0 are already being made available by a wide variety of vendors. Intel is providing software developers' kits (SDKs) for the Boot Integrity Services and PXE features of the specification—along with a self-test ToolKit—and will begin holding WfM Baseline v2.0 Interoperability workshops beginning in Q1 1999.

Wired for Management has proven to be one of the most influential and widely adopted initiatives in the PC industry over the last few years. Moving forward, Intel will continue to advance the frontiers of manageability, paving the way for OEMs and IHVs to meet growing demand by the information technology marketplace for solutions that incorporate advanced system and software management capabilities.

About the Author:

Steve Tolopka is Director of the Managed Platform Lab in the Intel Architecture Labs, where he leads the team that defined the WfM Baseline specifications and Network PC System Design Guidelines. His responsibilities include helping to create and deliver building blocks that lower the total cost of PC ownership by making PCs universally manageable.

For More Information:

Go to the Intel pressroom (<http://www.intel.com/pressroom/>) for the official Wired for Management v2.0 specification announcement.

Check out the WfM Developers' (<http://developer.intel.com/IAL/wfm/>) Web site to get the latest information, tools, design assistance and download the specifications.

See the Platform Solutions News Wired for Management Technology page (<http://developer.intel.com/solutions/tech/wfm.htm>).

Check out the latest news from the Intel Developer Forum (<http://developer.intel.com/design/idf>).

Remote Wake-Up Comes to Mobile Computing

By Clifton Laney
Mobile Wired for Management (WfM) Program Manager
Intel Corporation

Intel's Wired for Management Baseline (WfM) 2.0 specification takes important steps forward in providing solutions to the ongoing problem of mobile PC manageability. One of WfM 2.0's important enhancements is associated with remote wake-up capabilities.

Remote wake-up is a WfM technology that makes it possible for Information Technology support professionals to perform routine maintenance activities on PCs located at remote geographic locations—all from a central console. By handling maintenance tasks during off hours, IT staffs can upgrade software, back up data, and check for viruses without needing to disrupt the workdays of the users across their organizations. Call it maintenance at midnight, if you will; by any name, it saves time and increases productivity for users and IT professionals alike. And for the first time, remote wake-up can now be easily implemented not only on the desktop, but on Mobile PCs as well.

Power Up From Far Away

The key to remote wake-up is the ability to bring a system from a reduced power or sleep state up to one in which all management interfaces are available, and to do it all from a remote location. In order to provide remote wake-up capabilities, OEMs building next-generation mobile PCs must support such power-management technologies as the Advanced Configuration and Power Interface (ACPI), which is now effectively beginning to replace older Advanced Power Management (APM) technology.

Along with power-management capabilities that enable the system to go into a reduced power state—such as the ACPI-specified S3 state—a PC must also have a power-managed LAN or modem communications adapter to take advantage of remote wake-up capabilities. Remote wake-up also consists of a system designed with a “suspend power plane” that provides suspend current to the communications adapter when the system is in a low-power state.

Wake-on-LAN* for Mobile Computing

Until recently, the only way to provide remote wake-up capabilities in the mobile arena was to use a mobile PC in a docking station. But while it was indeed possible to implement a docking station solution using a PCI LAN card, the result was neither cost effective nor power efficient. Thanks, however, to the latest WfM 2.0 specification—coupled with rev. 6.1 of the PCMCIA specification, released earlier this year—remote wake-up capabilities are now available for mobile PCs with or without docking stations.

Mobile remote wake-up over a LAN can now be implemented in either (or both) of two ways: via LAN on the motherboard or by using a CardBus LAN adapter. In the case of a LAN on the Motherboard (otherwise known as LOM, or “LAN Down”) implementation, OEMs can turn to the Intel® 82559 LAN Controller to integrate remote wake-up capabilities for free-standing notebooks as well as those utilizing docking stations. The Intel 82559 LAN Controller is the industry's first true Fast Ethernet cross-platform solution, is smaller and simpler to use than previous-generation alternatives, and provides integrated Alert-on-LAN* management capabilities that build on the baseline established by the latest version of the WfM specification.

OEMs developing CardBus LAN Adapter-based solutions can turn to Xircom's* CardBus Ethernet Modem 10/100/56 and CardBus Ethernet II 10/100 adapters—simple and cost-effective ways to boost mobile computing performance, ensure highly scalable bandwidth, and improve the availability and serviceability of network links. In this configuration, ACPI support is not merely recommended; it's required. The new generation of CardBus Controllers that support remote wake-up with ACPI support are also required.

OEMs can also provide remote wake-up capabilities in their docking station designs by using a Wake-on-LAN PCI LAN adapter such as the Intel EtherExpress PRO/100+ Management Adapter.

Wake Up and Smell the Coffee

With WfM 2.0 now in place, the benefits are evident: WfM greatly enhances the manageability of all PCs, including mobiles. Given the need for better manageability across the business computing arena, remote wake-up is a core WfM technology that all mainstream and high-performance mobile PCs of the future will need to provide in order to succeed in today's highly competitive marketplace.

For OEMs and IHVs alike, the message is clear—design remote wake-up into your next-generation Mobile Pentium® II processor-based system.

About the Author:

Clifton Laney is Intel's Mobile Wired for Management program manager. His responsibilities include overseeing Intel's efforts with industry leaders and groups to advance the management capabilities associated with current and future generations of mobile computing products.

For More Information:

WfM Baseline Specification v2.0 Extends PC Management Capabilities

(<http://developer.intel.com/solutions/issue/stories/top3.htm>) in this issue of *Platform Solutions*

General Wired for Management information—<http://www.intel.com/managedpc/>

Workgroup Manageability—<http://www.intel.com/network/blocks/index.htm>

Remote Wake-Up—<http://www.intel.com/network/blocks/remote.htm>

LAN on Motherboard (LOM)—<http://www.intel.com/network/blocks/lom.htm>

"The Next Step in Network Connectivity," by Greg Young—

<http://developer.intel.com/solutions/archive/issue10/stories/top4.htm>

Platform News

News From IDF

Get all the latest platform news from the September IDF in the pressroom:

<http://www.intel.com/pressroom/kits/events/9809idf.htm>

Business

Join Technology @ Work

As a member, you'll receive in-depth information on key business technology issues, trends, opinions from industry leaders and forums with Intel executives. Register today at

<http://www.intel.com/businesscomputing/tech/index.htm>.

Intel Announces New Dual Port Server Adapter

Intel Corporation introduces the Intel® PRO/100+ Dual Port Server Adapter, the first dual port addition to Intel's server adapter family. The new adapter, developed with Compaq, helps increase flexibility by using a single PCI slot to service two network connections. Each connection can run at an independent speed, either 10 or 100 Mbps (megabits per second). This allows the server to be connected to two devices simultaneously, with each device capable of running at a different speed.

<http://www.intel.com/pressroom/archive/releases/FE081198.HTM>

Intel Introduces Pentium® II OverDrive® Processor For Pentium Pro Processor-Based Systems

The Pentium II OverDrive processor brings a new level of performance and Intel's MMX™ technology to owners of upgradable Pentium Pro processor-based business desktop PCs, workstations, and entry and midrange network servers. The Pentium II OverDrive processor upgrades existing upgradable 150- and 180-MHz Pentium Pro processor-based systems to 300 MHz, and upgrades existing 166- and 200-MHz Pentium Pro processor-based systems to 333 MHz.

<http://www.intel.com/pressroom/archive/releases/DP081098.HTM>

Consumer

Broadband access to the Internet is shaping up to be one of the most, if not the most important capability for consumers

<http://developer.intel.com/ial/home/broadband/index.htm/>

IEEE 1394

- It's a universal connection between PC and CE devices
- It's a true Plug and Play Interconnect
- It allows digital video editing on the PC
- It's shipping on Consumer Pentium® II processor-based PCs today.

<http://developer.intel.com/technology/1394/>

Intel's latest processor speed enhancements—the Pentium® II processor 450 MHz and the Intel® Celeron™ processors 333 MHz and 300A MHz

<http://developer.intel.com/design/pentiumII/prodbref/index.htm>

Server

New Release of server platform tool IOMETER tests TCP/IP, VI Architecture networking, disk I/O, and includes new enhancements such as flexible transfer sizes and I/O alignment control. Download your copy today!

<http://developer.intel.com/design/servers/devtools/iometer/>

Technology News

News From IDF

Get all the latest technology news from the September IDF at the pressroom:

<http://www.intel.com/pressroom/kits/events/9809idf.htm>

Microprocessor

Introducing the Pentium® II Processor 450 MHz

The Pentium II processor is now available in speeds of 450 MHz, 400 MHz, 350 MHz, 333 MHz, 300 MHz, 266 MHz and 233 MHz. Learn what is great about these high-performance Intel® processors for both home and business.

<http://www.intel.com/PentiumII/home.htm>

DVD

Join us at the U.S. DVD Conference in San Francisco, October 1–2

The two-day conference provides an excellent opportunity to explore the fast-extending scope of DVD, and latest format developments. Among key items on the agenda will be the recent standardization of DVD-Audio, DVD-RAM, DVD-R and DVD-RW. Also, there will be displays and demonstrations of the latest DVD products and technologies. Intel will be presenting as well as showing capabilities of DVD on the PC.

<http://www.dvdforum.org/>

Wired for Management

Intel releases new Wired for Management Baseline Specification v2.0

Download the specification.

<http://developer.intel.com/IAL/wfm/wfmspecs.htm>

Visit the new WfM developer Web site and view the design guide online.

<http://developer.intel.com/IAL/wfm/>

Intel Architecture Labs

IAL Adds Spice to Sausage Software

Intel® Web Design Effects (WDE) and Indeo® Media Kit (IMK) are now plug-ins for Sausage Software's HotDog® SuperToolz*. Developed within IAL's Internet Media Initiative, WDE and IMK plug-ins work within HotDog or as stand-alone tools.

Learn about these plug-ins and how they provide all the original benefits of IAL's Web-enhancing software at <http://www.sausage.com>.

New Home for Conferencing and Telephony

The Conferencing and Telephony Initiative has a new place for you to discover how IAL is enabling Internet telephony and video conferencing over existing networks and analog telephone connections.

<http://developer.intel.com/IAL/home/ct>

For instance, you can download the newly available Videophone-Ready Modem Handbook Specification, which defines requirements for Intel® Video Phone and provides detailed specifications for V.80 support.

<http://developer.intel.com/IAL/vidred/index.htm>

First Phase of SWAP Completed

The HomeRF* Working Group recently completed the first development phase for the Shared Wireless Access Protocol specification with SWAP, version 0.5. This review draft is only available to HomeRF member companies.

<http://www.homerf.org/press/momentum0798.html>

HomeRF's goal for SWAP is to create an open standard allowing PCs and other consumer electronic devices to communicate with each other without the cost of running new wires.

IAL's involvement with HomeRF is part of the Anywhere in the Home Initiative.

New Network Management Solutions

Hewlett-Packard and Intel are working together to develop a standards-based solution, called Policy-Based Network Management (PBNM), for managing network resources in multi-vendor environments.

<http://developer.intel.com/IAL/pbnm/index.htm>

New Add-on to Simple Network Management Protocol

Within the Internet Media Initiative, IAL engineers have developed an add-on module to the University of California, Davis-Simple Network Management Protocol (UCD-SNMP) package.

<http://www.ece.ucdavis.edu/ucd-snmp/>

Industry Events

ISPCON Fall '98

September 28-October 1, San Jose, CA

As a major sponsor of this conference and tradeshow, (<http://www.intel.com/procs/servers/events/ispccon.htm>) Intel is participating in educational sessions, workshop sessions, a keynote address, a special panel discussion on Linux*, and on the exhibit floor. Come and learn about Intel's newest Pentium® II and Pentium II Xeon™) processor-based servers, and the latest in networking products and Internet server solutions for Windows NT* and UNIX*.

U.S. DVD Conference

October 1–2, San Francisco, CA

The two-day conference provides an excellent opportunity to explore the fast-extending scope of DVD, and latest format developments. Among key items on the agenda will be the recent standardization of DVD-Audio, DVD-RAM, DVD-R and DVD-RW. Also, there will be displays and demonstrations of the latest DVD products and technologies. Intel will be presenting as well as showing capabilities of DVD on the PC.

<http://www.dvdforum.org/>

Power 98

October 4–7 Santa Clara, CA.

This conference brings together leading manufacturers of batteries, power supply systems, electronics components, mobile computing products, and wireless communications devices. Intel's Bob Jackson will participate on a panel on power management. <http://www.gigaweb.com/events/>

Fall Internet World 98

October 6–8, New York, N.Y.

Conference provides opportunity to learn about Internet, Intranet, and Web applications. Intel's Gregg Adkin and Ken Stober will participate in a panel discussion on "Web TV."

<http://events.internet.com>

The Bluetooth Developer's Conference

The Developer's Conference is a worldwide event sponsored by the Bluetooth SIG founders, and will be held in the U.S. this October. Created for SIG members, the conference is designed to give companies the information and contacts they need to develop and market products based on the Bluetooth technology. Highlights include:

- A chapter-by-chapter review of the Bluetooth technology specification, including technical as well as legal components.
- Detailed implementation training that takes you beyond the spec and helps you design real products.
- Business development and networking opportunities with other Bluetooth SIG members who are committed to bringing products to market.
- Marketing and promotions planning for product launches.

For more information about the Bluetooth technology or joining the Special Interest Group, and for upcoming details of the Bluetooth Developer's Conference, check out <http://www.bluetooth.com>

Next Generation Networks

November 2–6, Washington D.C.

Understanding the future trends in high performance networking. Intel's Chuck Smith, will present "New Development in Networked Collaboration," on November 4th.

Comdex Fall

November 16–20, Las Vegas, Nevada

Major show for computer industry's independent resellers of computer systems and related products.

<http://www.comdex.com>

Intel Networking Events & Training

For Intel's events and training programs on networking products and technologies, please visit the Intel networking events page.

<http://www.intel.com/network/events/index.htm>

—End of Platform Solutions Issue 13—